Rapid Damage Assessment for Amateur Radio Groups

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How Amateur Radio Operators Can Help Fire Departments In Times of Need.

Introductions.

- Who I am.
- What do I do?
- How did this project come about?
- What is the Executive Fire Officer Program?
- What does this project have to do with you?

Why are we going to talk about damage assessment?

- Nisqually Earthquake. What happened at the fire department was that decisions on deployment were driven by 911 calls.
- At 911/dispatch. The call center was overloaded and calls were dispatched on an “on received” basis.
- Most fire departments initially overwhelmed.
- Cell phone service disrupted. Fire department police radio systems very congested. Dispatch overwhelmed at times.

Were we successful in managing the response to the Nisqually Earthquake?

So what can we do to improve?

Good incident information drives good decision making.

So how can we improve incident knowledge to make better decisions?

- Hire more cops and fire fighters?
- Install more cameras?
- Make sure 911 will never go down?

Ideas/past work as of 2012.

There are 43 past projects on rapid damage assessment at the National Fire Academy.

There are 4 projects that have looked at Amateur Radio.

There are no NFA projects that have looked at damage assessment by amateur radio groups.

Turning ideas into something that can work!

Find a community partners to match needs/tasks.

-Who is “distributed” in a community?

-Has an ability to communicate independent of normal communications methods?

-Rapid response capability?

-Can readily adapt?

-Is available to participate?

Turning ideas into something that can work!

Basic concepts

Pre-design mission details.

This includes:

- -Mission targets (Where to check)
- -Forms (How to document)
- -Training (How to go from start to finish)
- -Pathways of communications.

Turning ideas into something that can work!

Basic concepts (2)

Through pre-design, ensure the following:

-The process is simple.

-The process is easily managed.

-The process is functional and efficient.

-Plan for various scenarios (bad to worse).

-Plan to make it turn key. No “advanced” training.

Turning ideas into something that can work!

The key’s of success.

-Identify a group(s) of volunteers for the mission.

-Build a class/instruction around the group and the mission.

-Drill and adjust accordingly.

Turning ideas into something that can work!

The class objectives:

-Provide a basic understanding of “Rapid Damage Assessment”.

-Evaluate examples and the process of “Rapid Damage Assessment”.

-Set the stage for Thurston County ARES/RACES to execute a mock damage assessment drill.

-Run a drill that tests basic concepts.

What is Rapid Damage Assessment?

It’s the first of three FEMA defined assessments of a disaster area.

The purpose of a Rapid Damage Assessment is to paint a picture of an incident and look at **life saving needs, imminent hazards, and critical lifelines**.

Also called a “Rapid Needs Assessment” or RNA.

What is Rapid Damage Assessment?

The other forms of assessment come much later in the event. We will not address these further.

“Preliminary Damage Assessment” (PDA) puts a dollar value to identified damage.

“Combined Verification” (CV) includes a detailed inspection of damage to individual sites by specialized personnel.

What is Rapid Damage Assessment?

The general plan for team members to do the following:

1. Activate. Net Control should activate and roll call occur when possible.

2. Begin the process of checking areas by priority and geographic location.

What is Rapid Damage Assessment?

The general plan for team members to do the following:

3. Systematically identify damage and the incident situation in simple format and language. Record this individually.

4. Report your findings to net control as time and capacity allow.

The “Windshield Survey”.

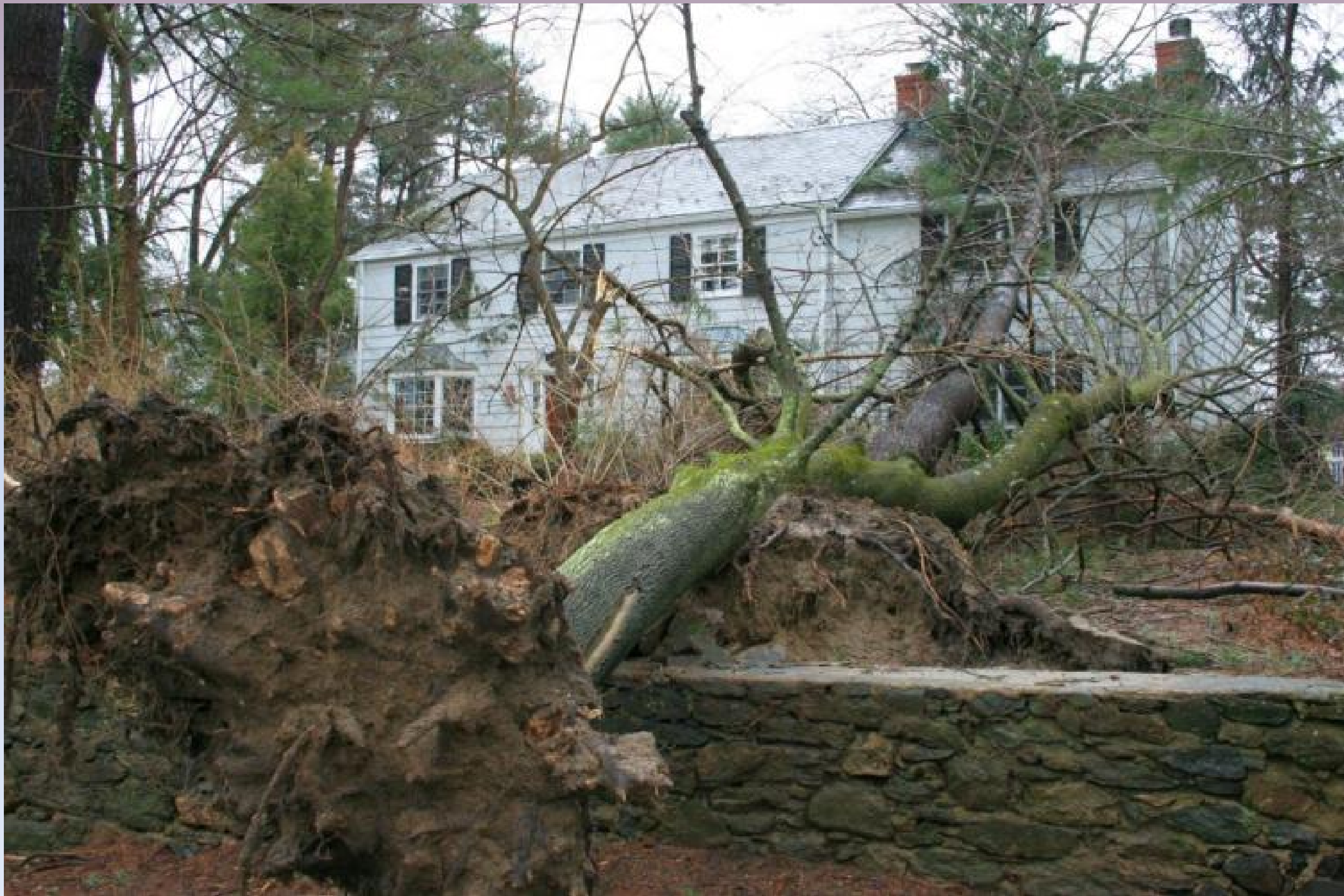
A visual inspection of an area or specific object (a house, a bridge for example) in a rapid fashion frequently done by vehicle or through the “windshield”.

The 4 Degrees of Damage

- Destroyed
- Major Damage
- Minor Damage
- Affected

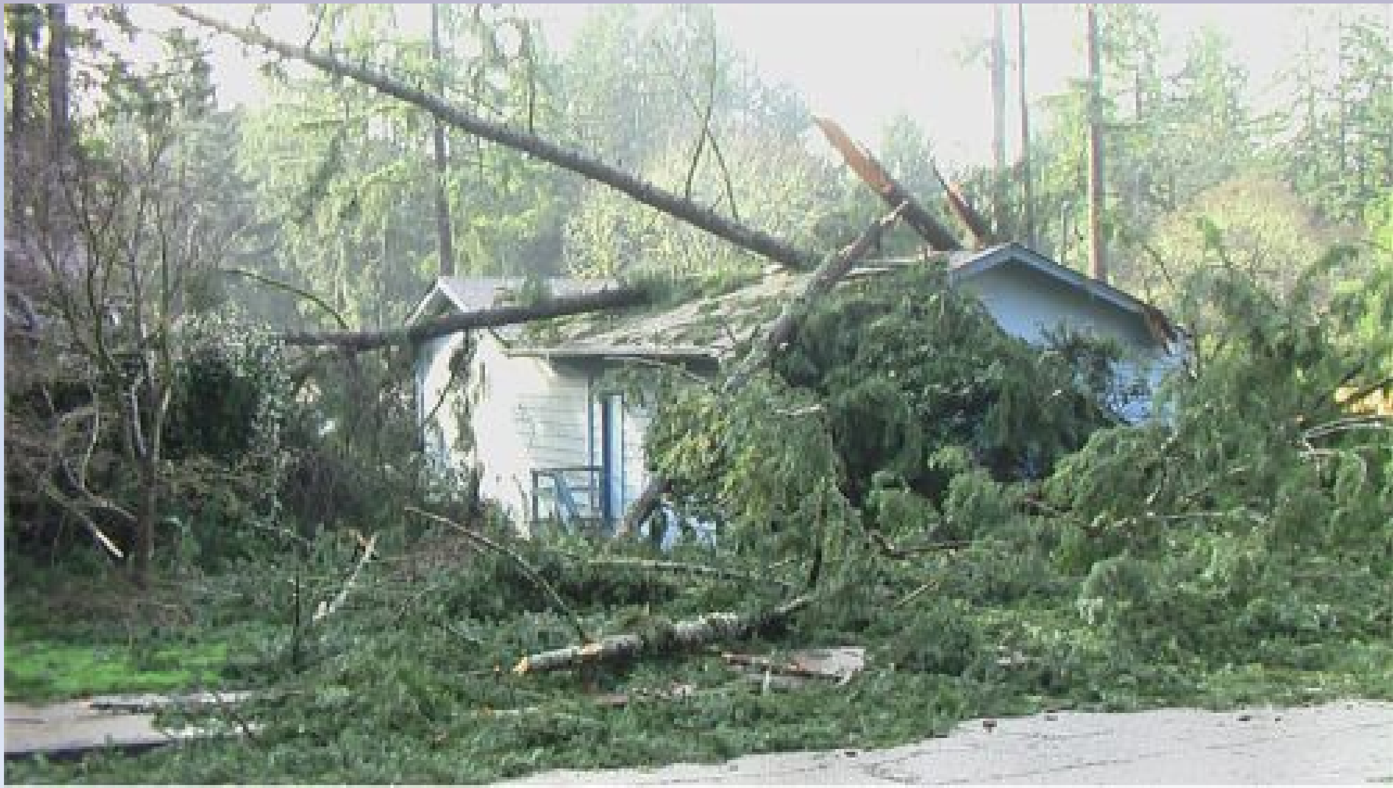
“Affected” by the wind/tree damage.

The house has a tree on it. The roof is intact, the windows appear ok, and the house looks very livable. This residence is “affected”.



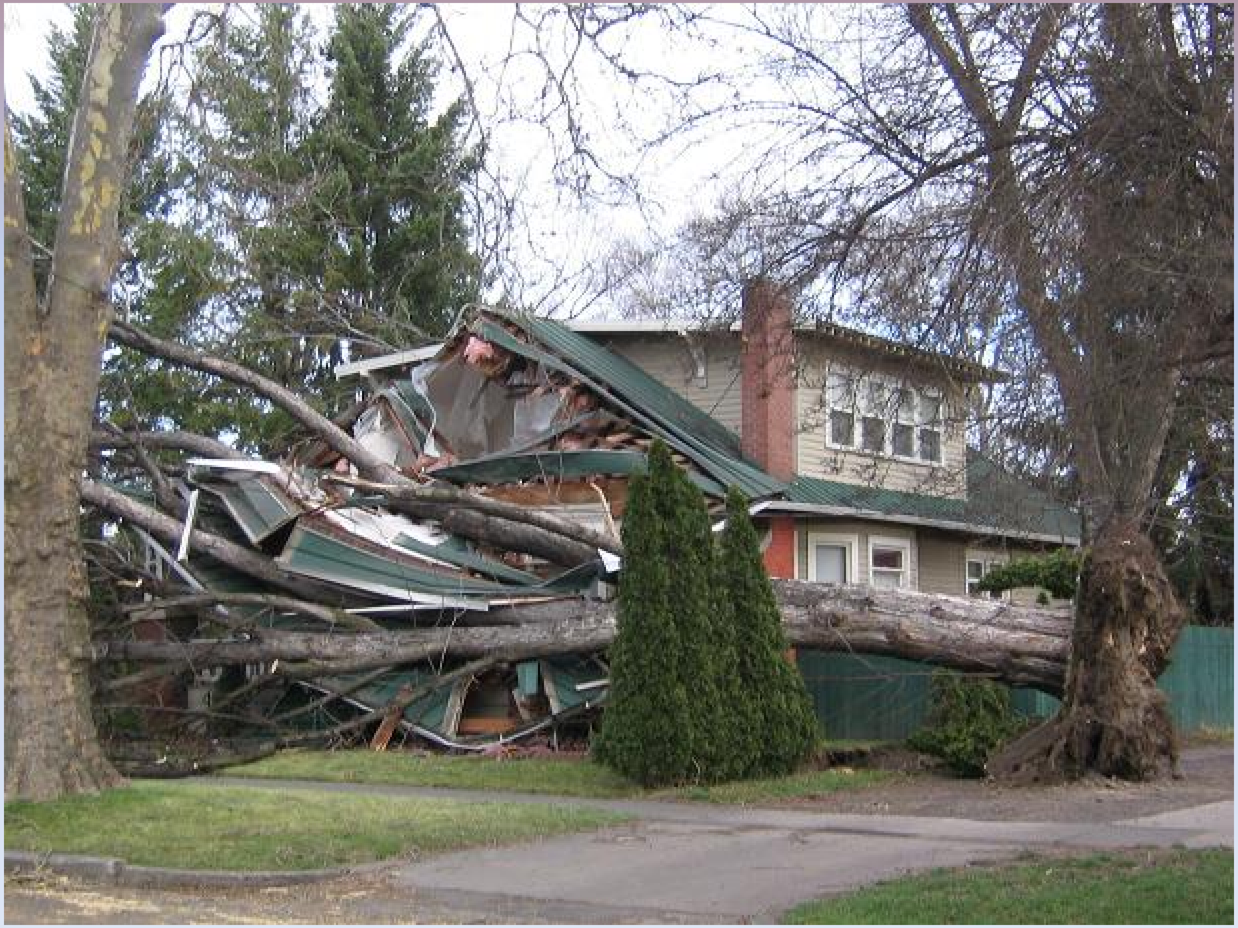
“Minor Damage”

The house has a tree on it. The roof is damaged, but only one area o f the residence is affected. It’s repairable. Damage limited to 1 wall or roof.



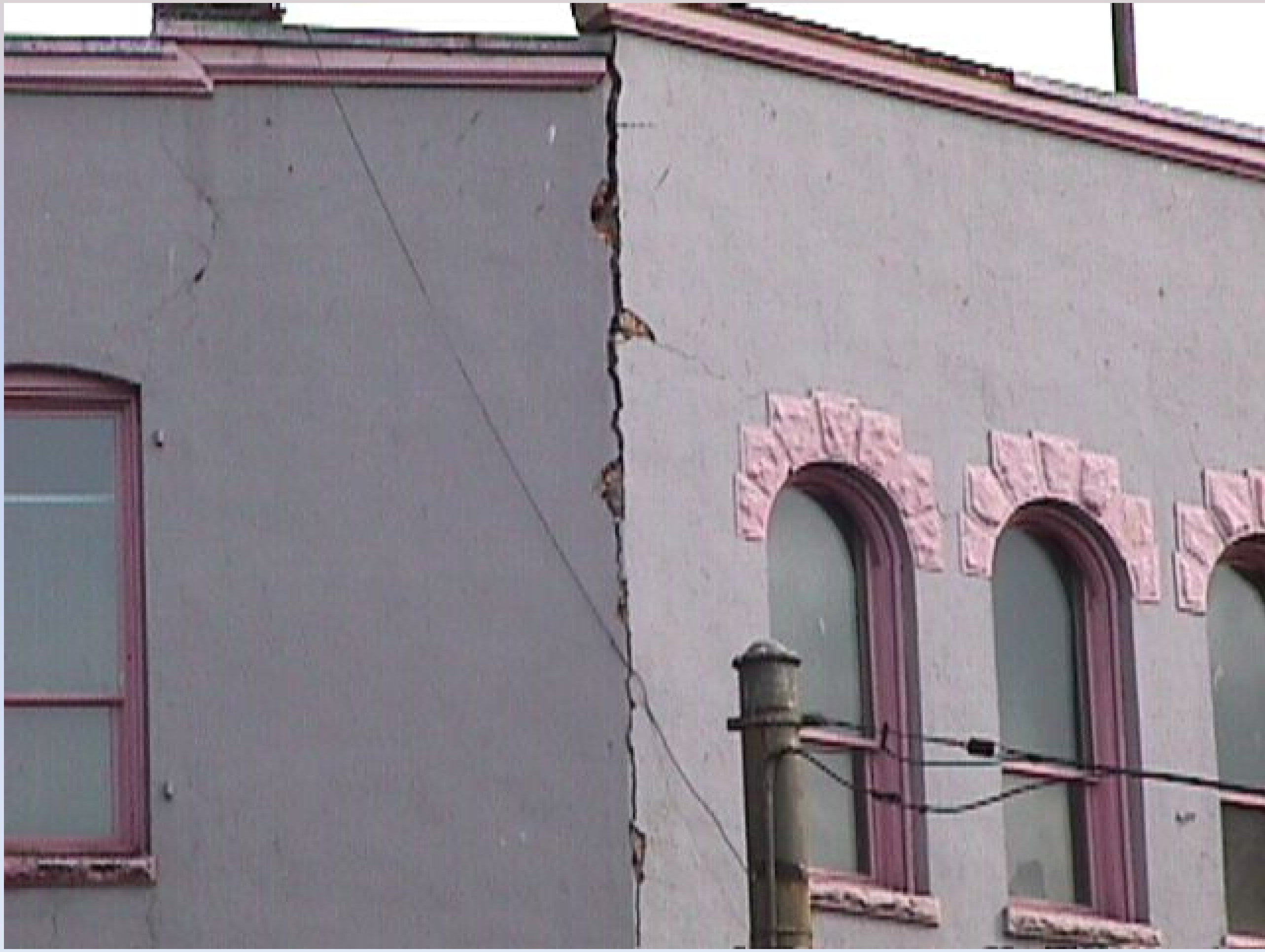
“Major Damage”

The house has a tree that went through the roof to the ground. Multiple walls damaged. Heavy damage, may not be re-buildable.



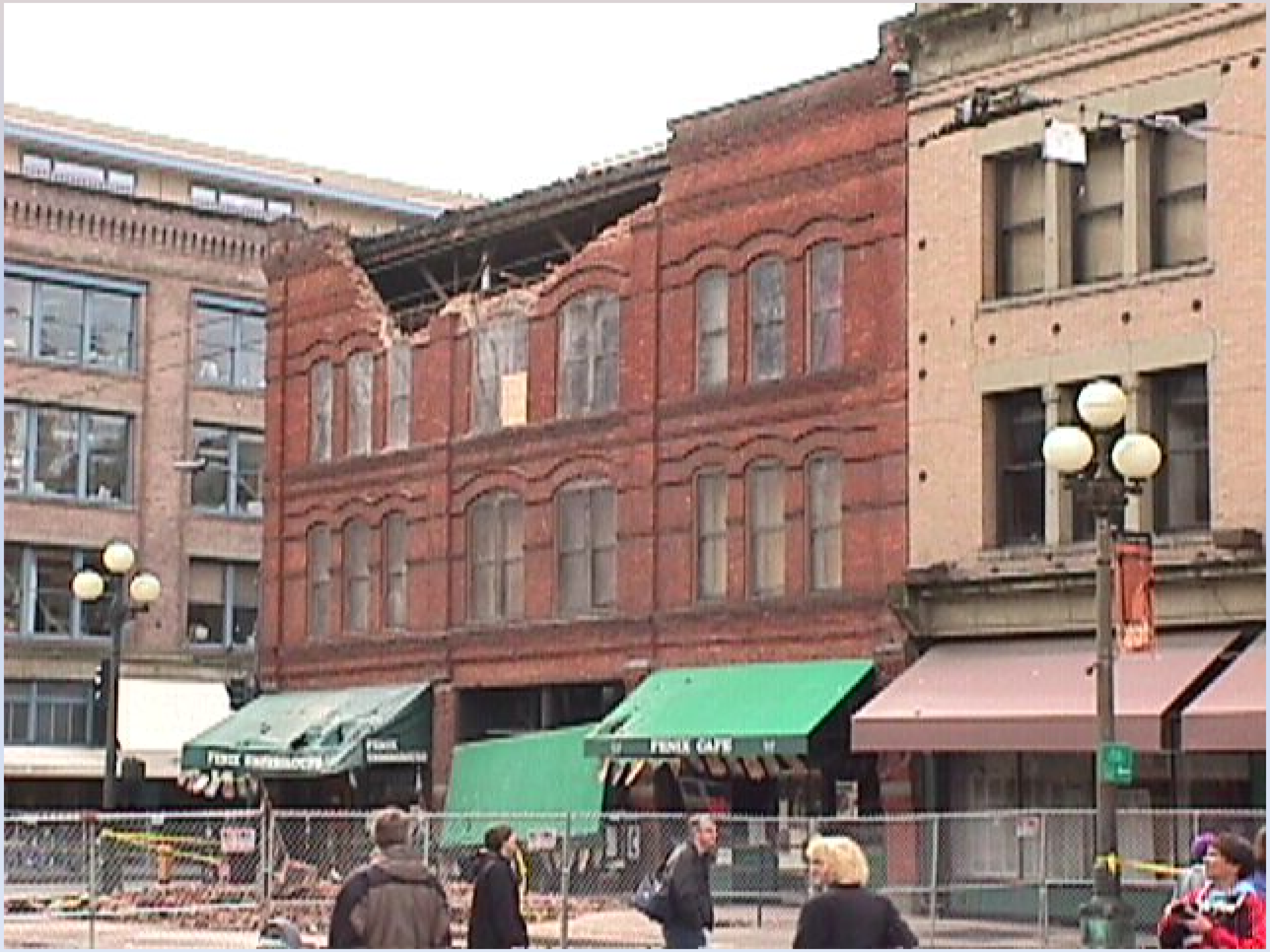
“Affected” by Earthquakes.

Masonry building with exposed cracks. Building my have additional damage but on the outside, it appears mostly normal and likely functional.



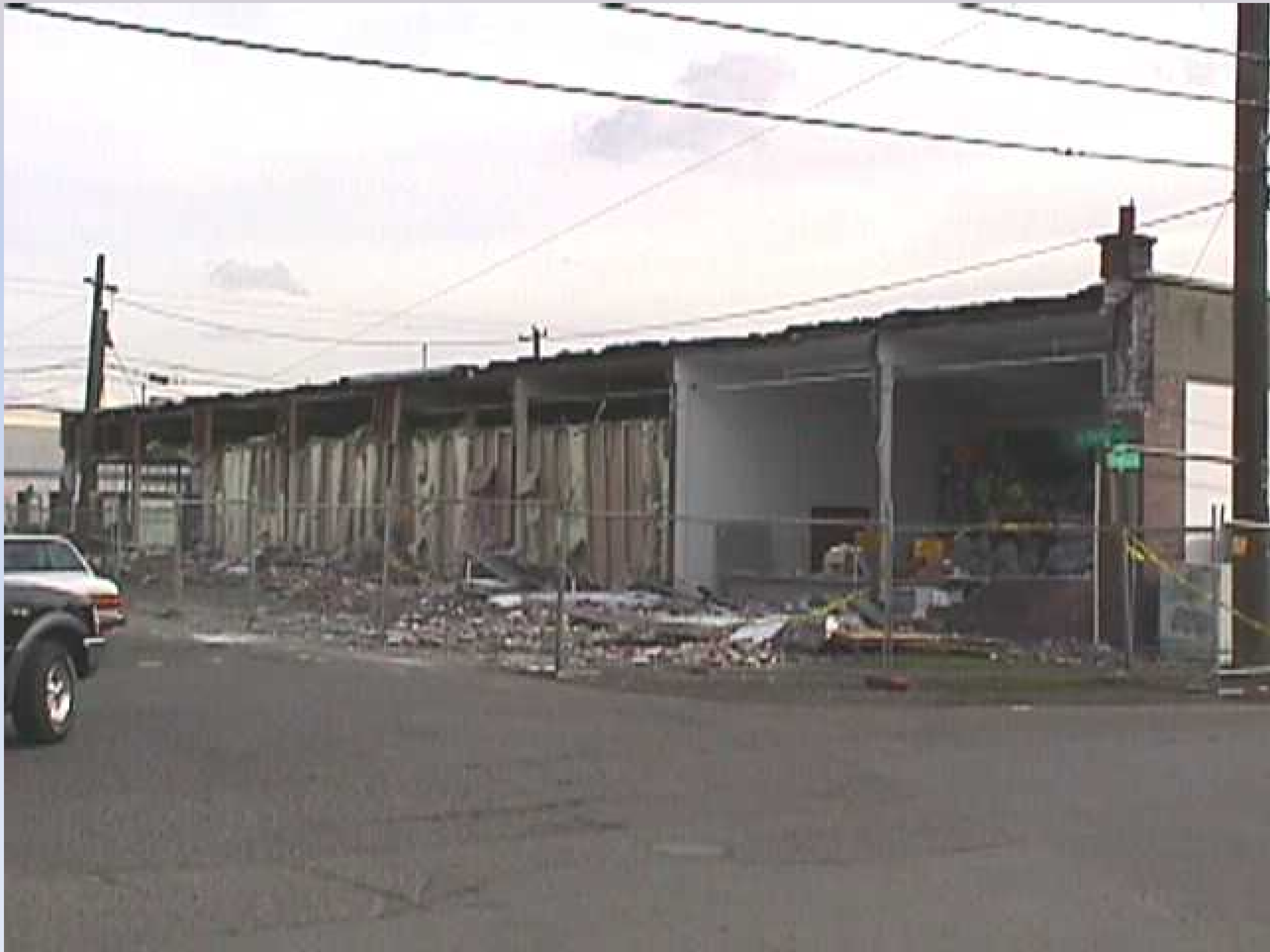
“minor damage”

Partial wall collapse but clearly repairable. Not a complete wall failure; building probably needs further technical inspection.



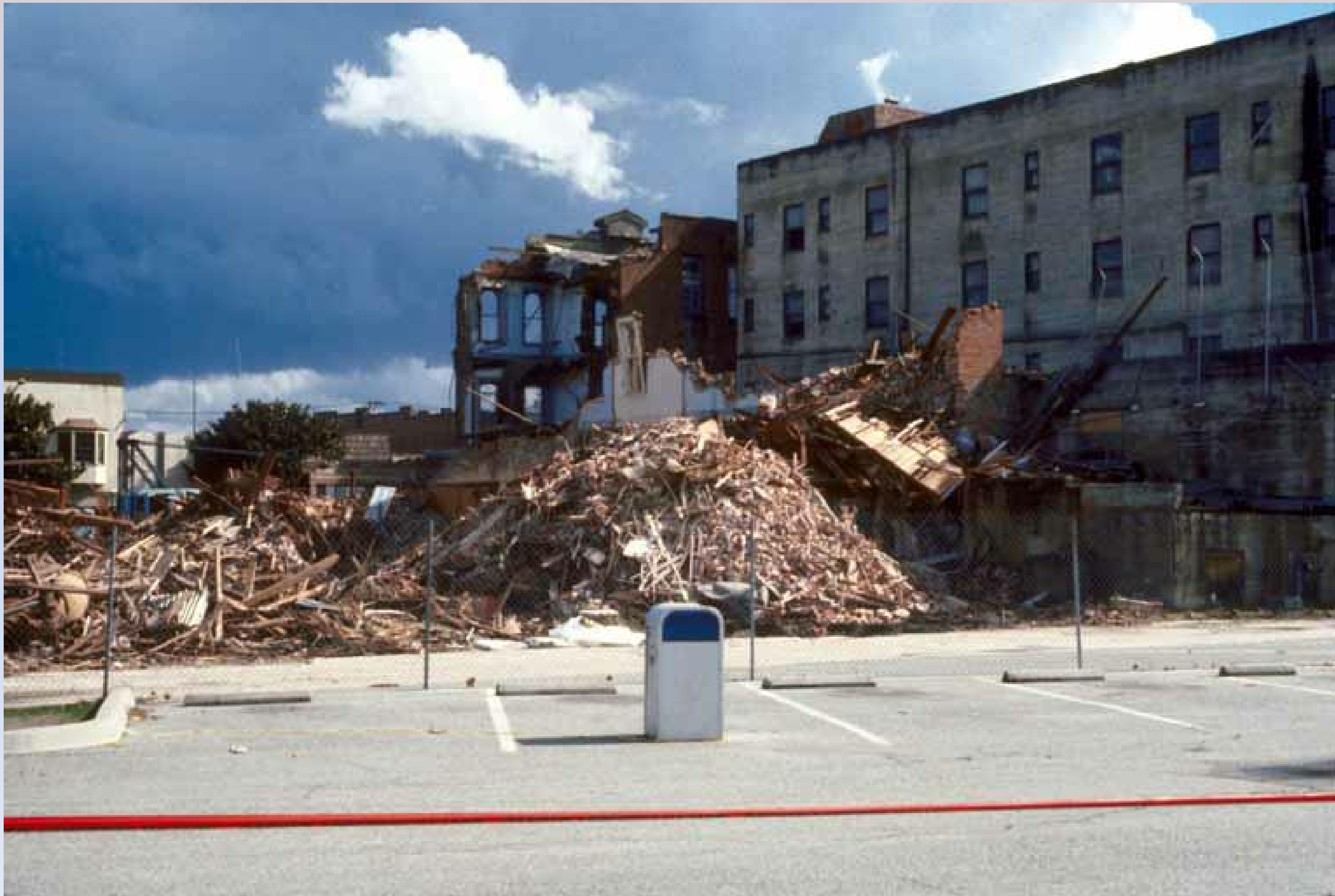
“major damage”

Entire wall collapse and perhaps other walls affected. Not habitable, building possible destroyed.



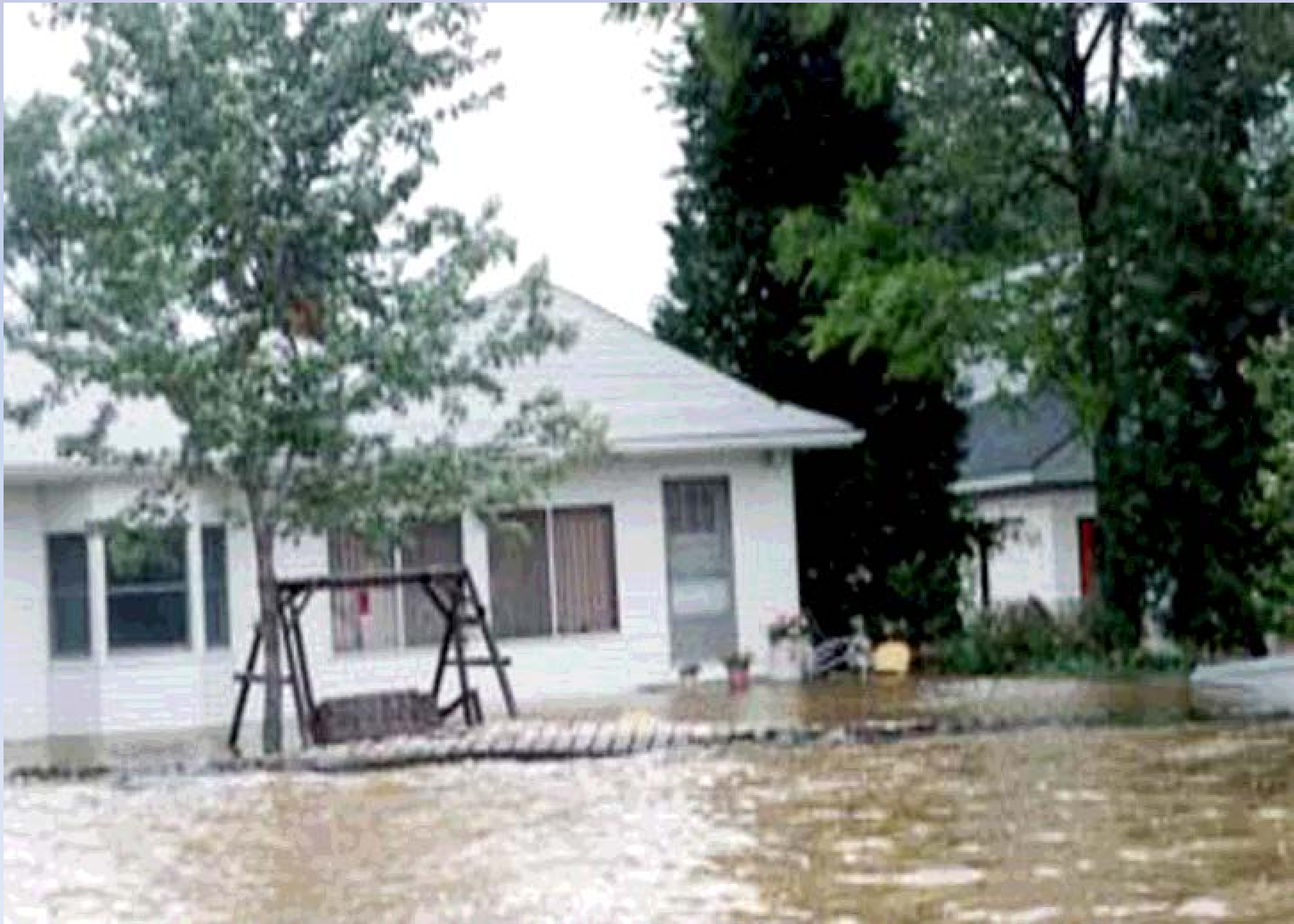
“Destroyed”

’nuff said



“Affected” Flood Damage

Less than 2” of water on floor.
Foundation intact.
No obvious structural damage.



“Major” Flood Damage

2 to 5 feet of water on the first floor. Potential for major damage in the structure.

“Destroyed”

Greater than
5’ of water.

Other Examples of Damage. If it doesn't fit a category is it reportable? Yes!

Mission Priorities. What’s our inspection targets and in what order?

Typically, missions are pre-designed and targets for “windshield survey’s” are identified in advance. Most cities and counties have established priorities that include life safety, critical infrastructure, essential facilities, or other factors like Haz-mat.

Mission Priorities. What’s our inspection targets and in what order?

Pre-designed routes and “targets” for inspection ensure completeness and help reduce duplication of efforts.

But if we have to go outside the pre-plan, here are some criteria for building our own “ad-hoc” target list.

Mission Priorities. **Life-Safety**.

Items to look for and report.

-Search and Rescue (how many, where, how, special resources needed)
-Deaths and injuries,
-Evacuation (need and status).

Mission Priorities. **Infrastructure**. (Also known as “life lines”)

Items to look for and report.

-Natural Gas
-Electric
-Water
-Major Transportation routes.

Mission Priorities. **Essential Facilities**.

Items to look for and report.

- Hospitals
- Police Stations
- Fire Stations
- Shelters
- Communication Systems.

FEMA vs. American Red Cross

- The American Red Cross has a congressional mandate to conduct certain types of data assessment.
- There is no reason not to work with the ARC.
- Damage assessment can be done by multiple agencies concurrently.
- **ARC and FEMA do damage assessment differently.**

FEMA vs. American Red Cross

- The coding or differences between the two systems can be significant.
- Default to the FEMA method and try to be as close to accurate as possible.
- Simply noting what you see allows for any interpretation later.

Where does the information go?

- ECC or Emergency Communication Center (EOC) can input the information into their forms/computers.
- Compile it with other damage reports.
- Forward it to the state EOC.
- Forward it to an incident command post.
- An ICP can also move the information to whomever needs it.

How is the information used?

- Allows decision makers to prioritize needs.
- Allows decision makers to estimate resource needs.
- Allows decision makers to estimate other problems associated with the data (flood severity in one area versus another)
- Allows decision makers to request assistance or trigger certain declarations.

The Test.

Damage severity:

1. 10 Questions on damage severity.
2. Circle what type of damage you observe.

Incident significance:

1. 5 questions on reportable or not.
2. Circle “reportable” or “not reportable” when it comes to problem identification.

Damage Assessment Job Aide

A Quick Guide to Damage Assessment Definitions and Descriptions

Affected: Object has received minimal damage and usable now without repairs. 2” or less for flooding on the first floor

Examples: Carpet on first floor is soaked, chimney and porch is damaged, landscaping is damaged, business sign is damaged, broken windows, some shingles missing. etc.

Minor Damage: Structure is habitable now but needs minor repairs. Will take less than 30 days to repair. 2” to 3’ of water in first floor or 1’ of sewer.

Examples: Tree fallen on structure, business inventory destroyed, shingles or roof tiles missing, smoke damage, interior and exterior walls have minor damage, etc.

Major Damage: Structure is not habitable. Extensive repairs needed that will take longer than 30 days to complete. 3’ to 5’ of water in first floor.

Examples: One room destroyed, foundation damaged, production equipment/office damaged, roof is missing or collapsed. Outbuildings are damaged/destroyed, exterior walls are damaged, structure penetrated by foreign object, etc.

Destroyed: Structure is a total loss or is permanently uninhabitable. Not economically feasible to repair. Water 5’ or higher.

Examples: Structure is leveled or second story is missing. Foundation or basement is damaged.

Question 1.

Basement fully flooded. 4 to 5’ in a residence.

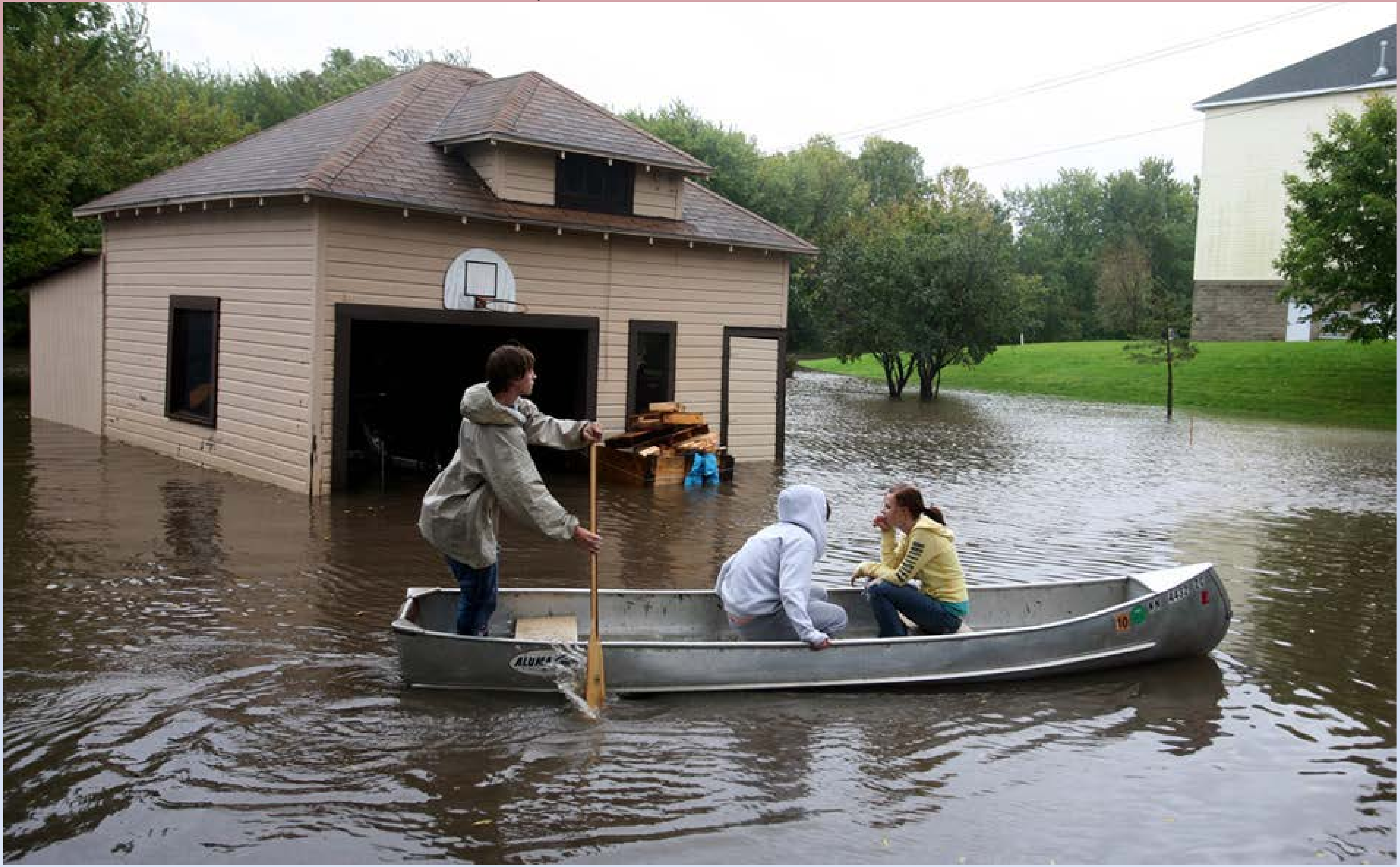
Question 2.

No Basement. Less than 1’ of water in residence.

Question 3.

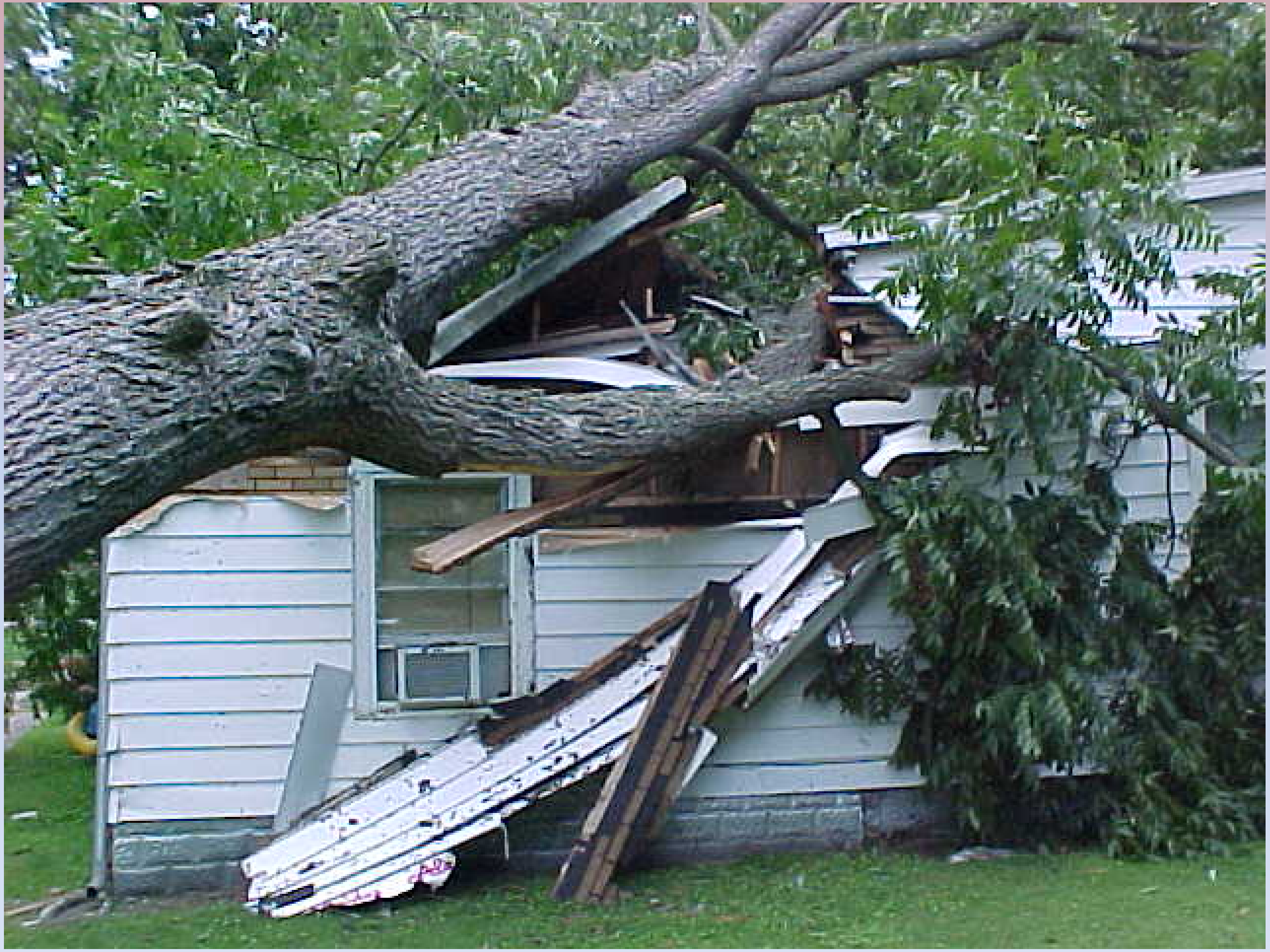
No Basement. Surrounded by water. No water entry.

Question 4.



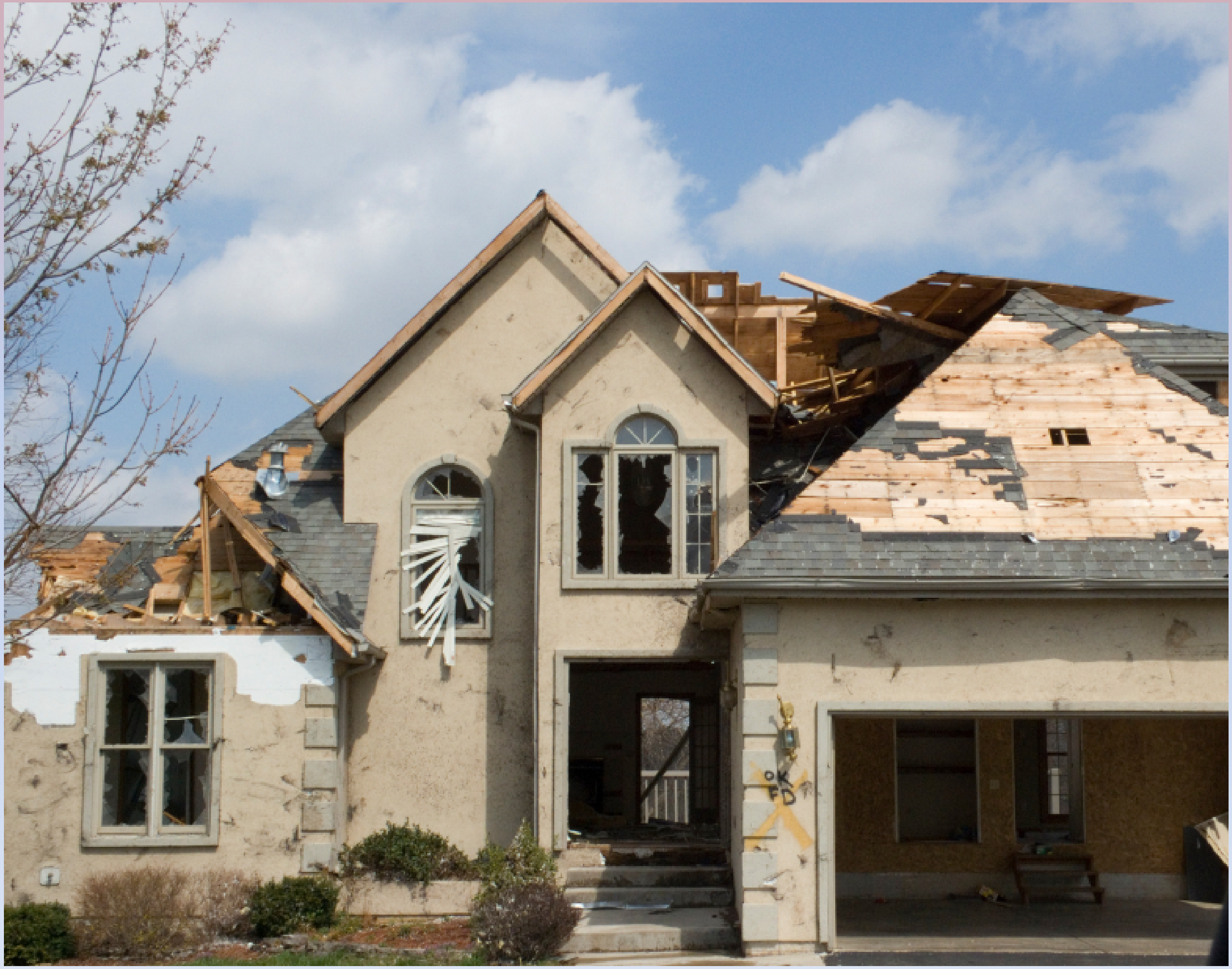
Three feet of water on the main floor. No basement.

Question 5.



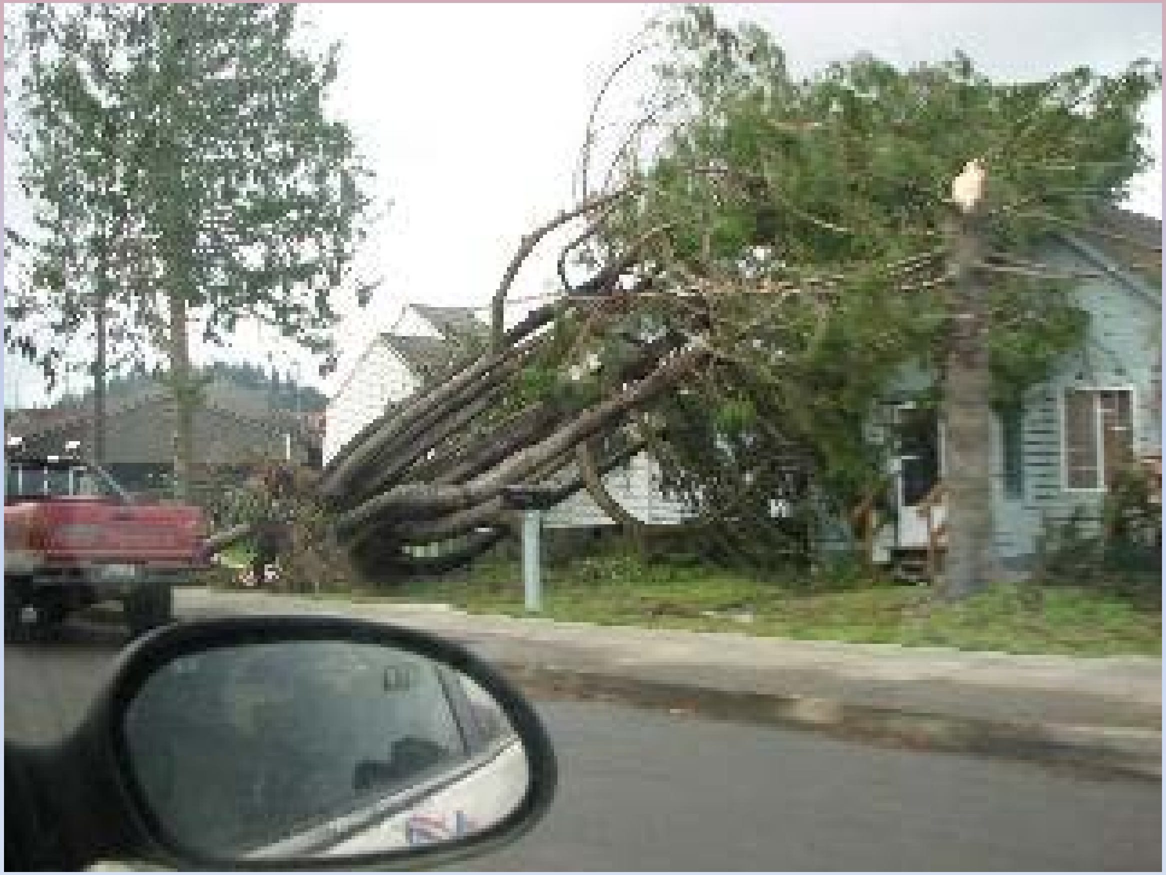
Roof is damaged, some wall damage, structure still stands.

Question 6.



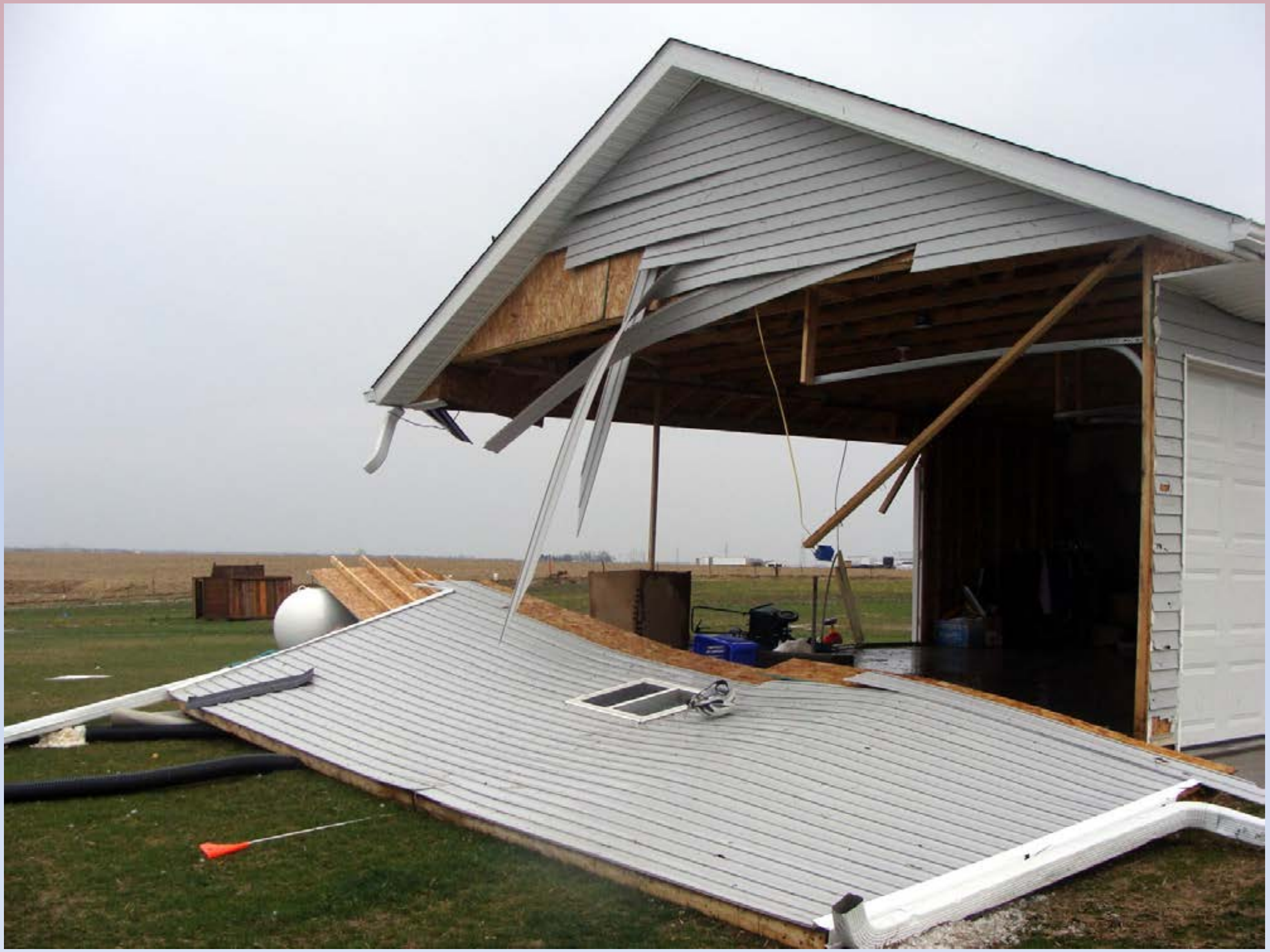
Roof is damaged, all walls intact, structure still stands.

Question 7.



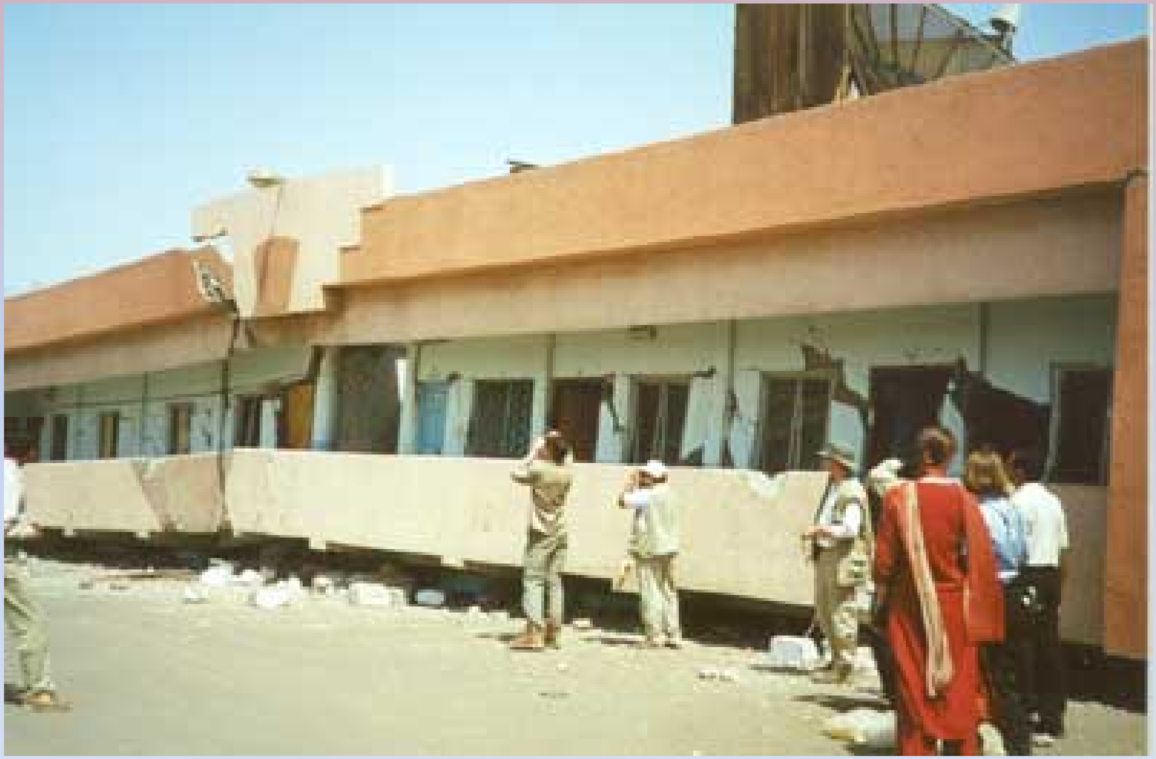
Roof is damaged, single wall is damaged, structure still stands.

Question 8.



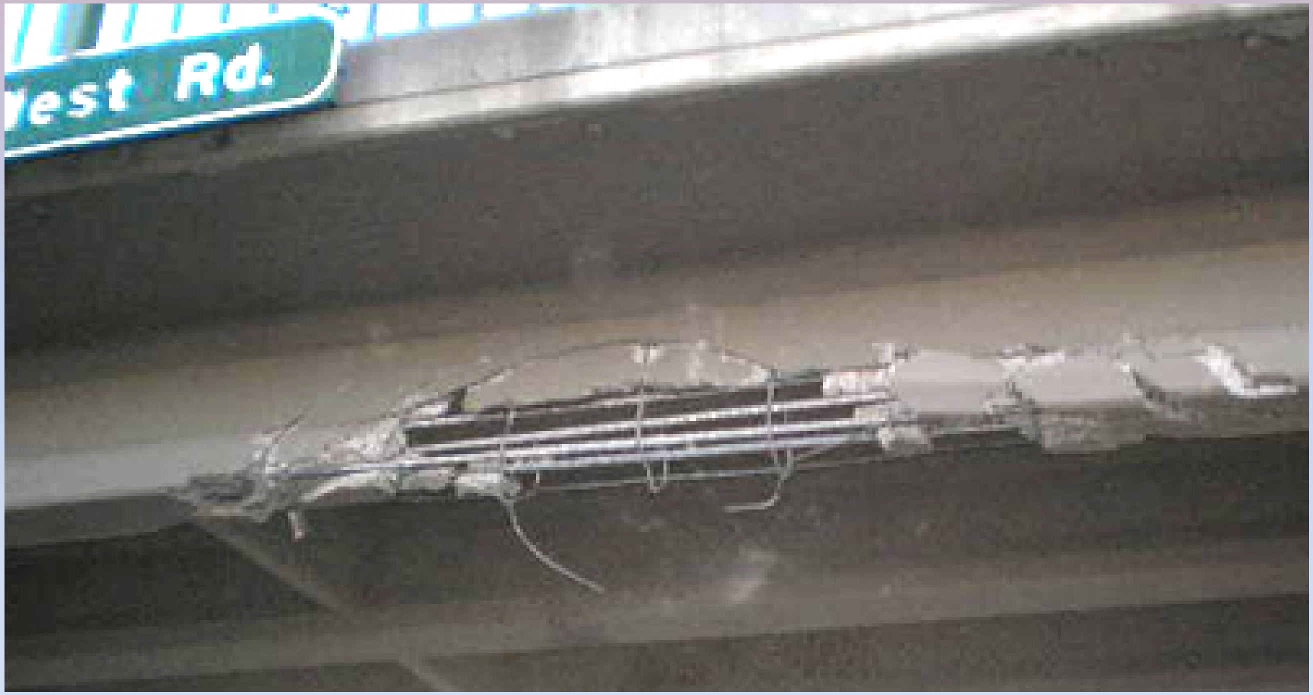
Roof is damaged, multiple walls damaged, structure still stands.

Question 9.



Two story building is now one story.

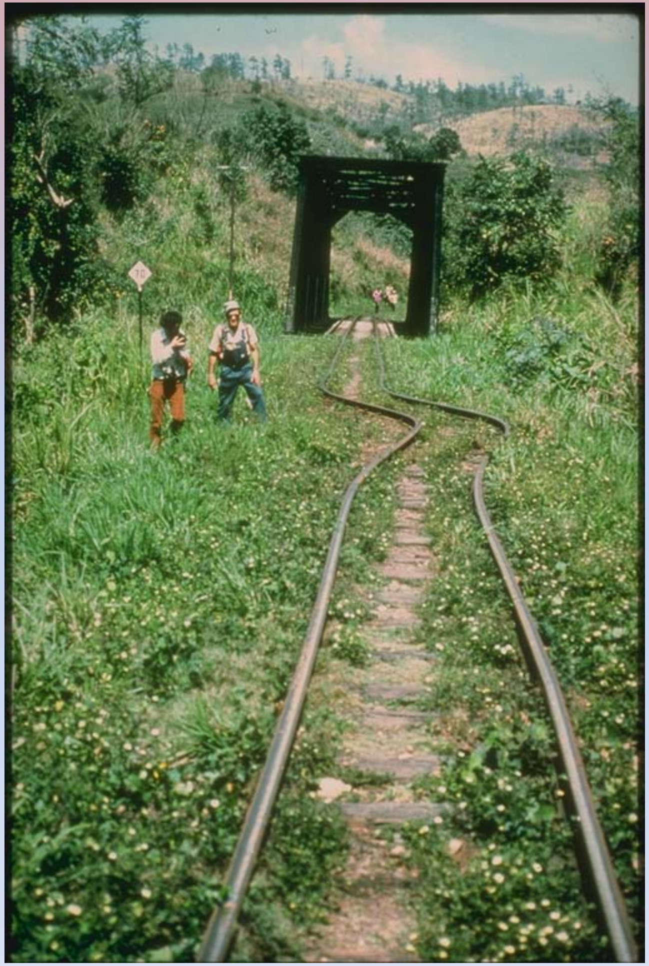
Question 10.



Overpass following an earthquake.

Question 11

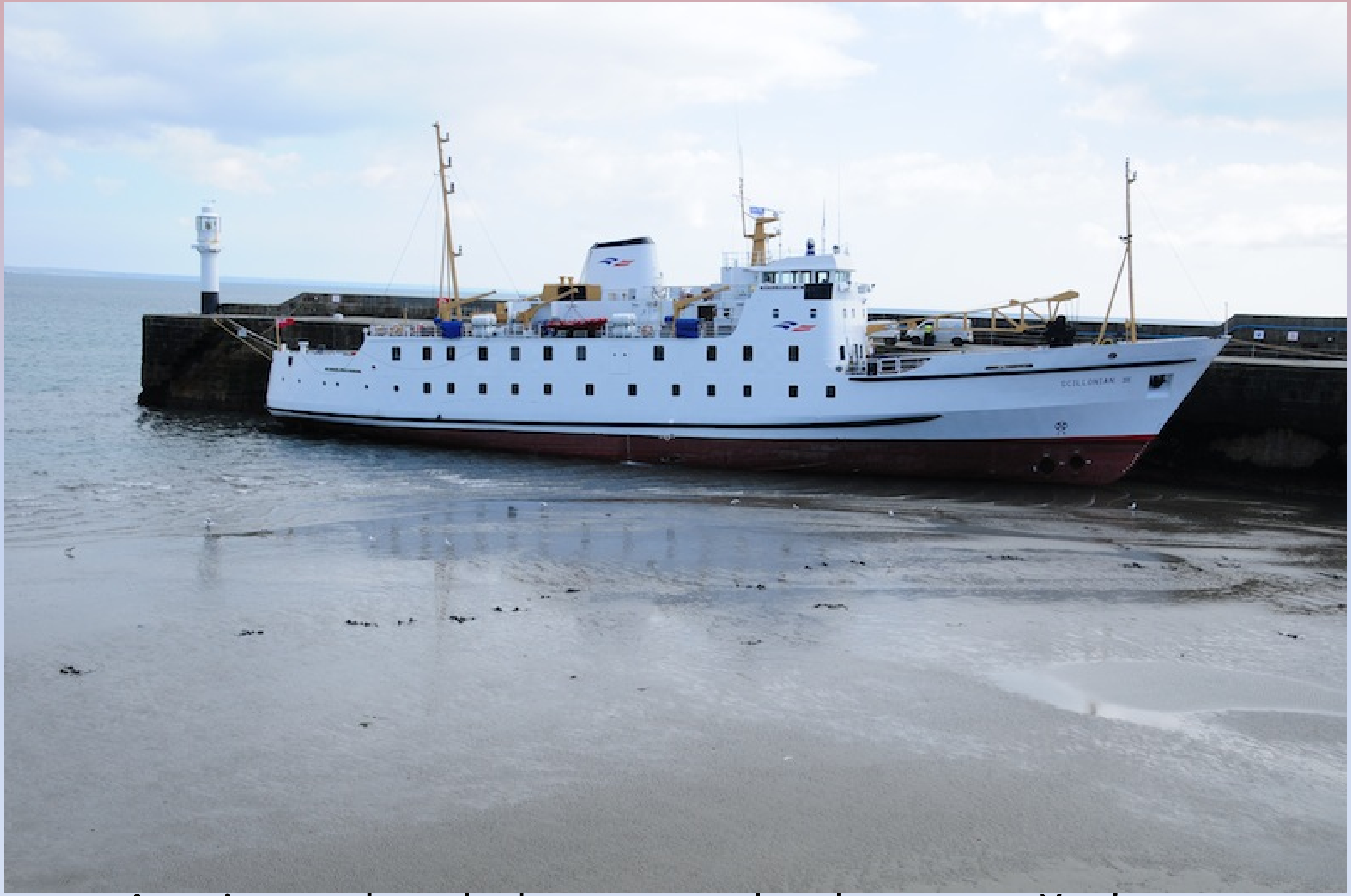
Is this incident immediately significant?



A major earthquake has occurred. This is an unused rail line.

Question 12

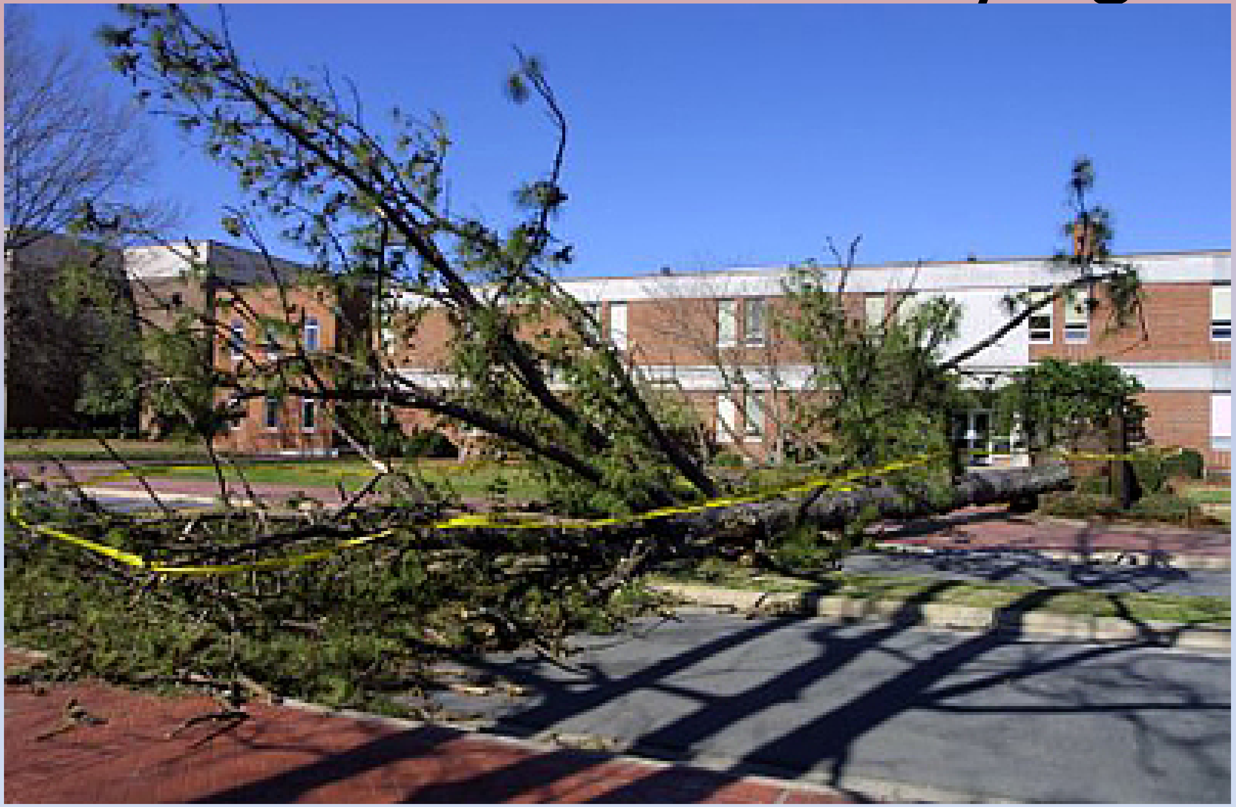
Is this incident immediately significant?



A major earthquake has occurred an hour ago. You're near downtown Olympia and you see this at the Port of Olympia. High tide is in 1 hour.

Question 13

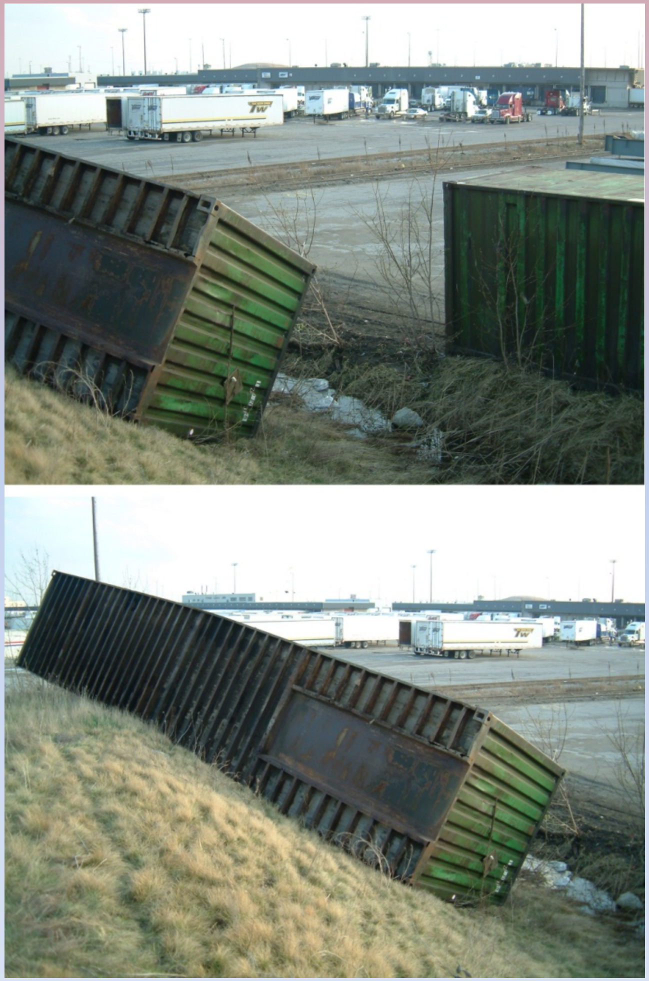
Is this incident immediately significant?



A major windstorm has occurred. This is in a parking lot of Evergreen state college. The tree has hit nothing.

Question 14

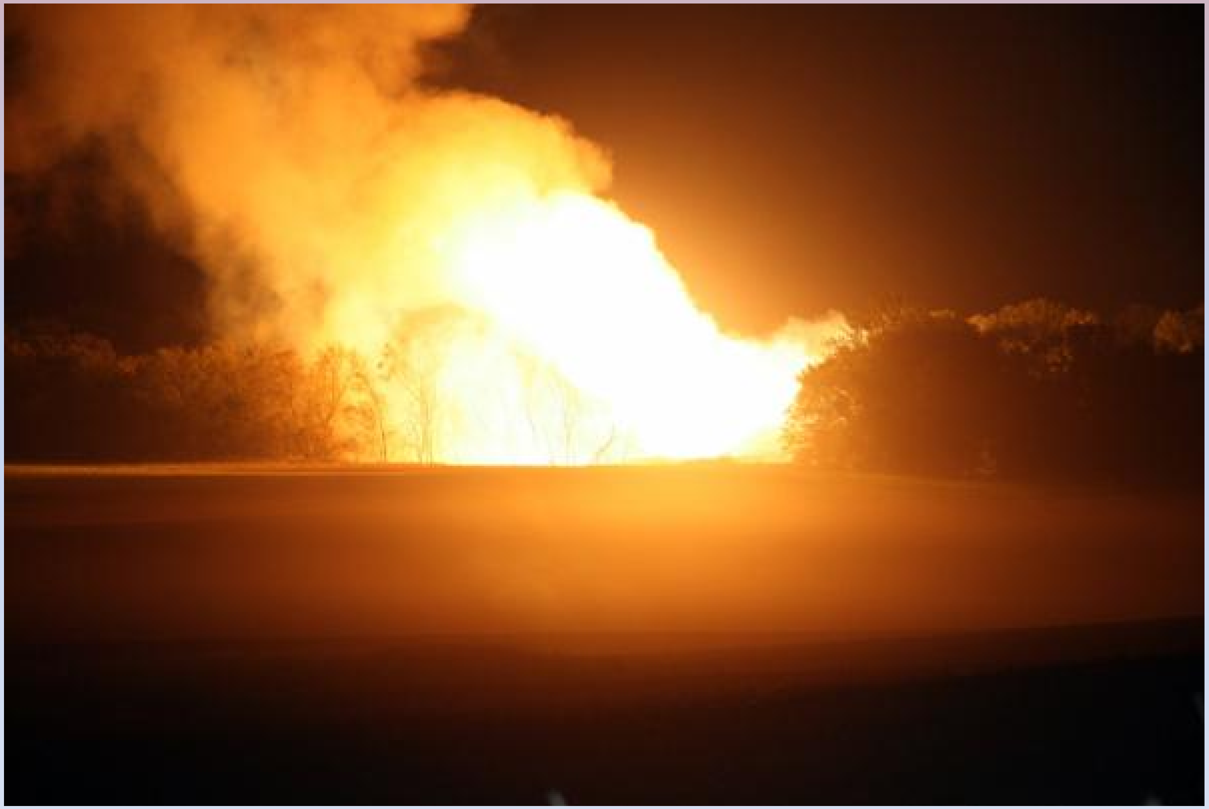
Is this incident immediately significant?



A major windstorm has occurred. This is at the port of Olympia.
You are checking utilities and KGY on the priority list.

Question 15

Is this incident immediately significant?



An earthquake has occurred. This is occurring from a farmer's field near Yelm Highway on Steadman Road. It sounds like a jet engine.

The Drill. The scenario.

It will be around 0900. An earthquake has occurred that is strong enough to break windows in your house, cause items to fall from walls, and fracture some masonry and your driveway. Your cell phones and land lines don’t work, and the power is out.

Damage assessment is indicated.

The Drill. The Scenario.

- 50 to 70 items will be checked with in Lacey Fire District #3.
- You have a listing of those items pre-assigned.
- You also have a listing of basic finds at these sites that you can enter into the forms and then report.

The Drill. Final Thoughts.

Can you use multiple channels and different net controls? For example, could areas checking Lacey North use VHF and those checking Lacey South use UHF?

The Drill. Final Thoughts.

Can net control be established out of the EOC in the field and then transferred later?

Could packet radio be useful?

The Drill. Final Thoughts.

What happens if no ARES members check in one area of the search/survey?

Can inspection points be assigned?

What happens if one member discovers a major pipeline failure and fire? Does that impact what other “surveyors” might do?

Drill Contents: **Damage Assessment Forms**

Forms given to response team members

Date of Event:			Incident name/type:						
Field Observation Report or		Collection Log:			(circle the choice to the left)				
General Area of Collection						Member Name			
Entry #		Time the entry was checked:							
Address or Location of Entry:									
Type of location inspected :									
Primary Problem: (circle it)									
Life Safety		Deaths and injuries				Type and Severity			
Iminent Hazard	(circle it)	Electrical	Gas leak	Collapse	Fire	Trapped	HazMat	Flood	Other
Infrastructure/lifeline (circle)		Utility	Transport	Critical Service		Communications		High Life Threat	
Describe the problem:									
Identify Special Needs:									
Damage is : (circle one)		Affected		Minor Damage		Major Damage		Destroyed	

Drill Contents: Damage Assessment ***Pre-Planning***
Forms given to response team members

All potential response team members are given a predesigned “Target List”.

Target lists come from a few sources but are simply the list of vital structures and locations in a community.

Typical sources of “Target lists” or locations to check for damage assessment come from:

-County/City emergency management agency plans.

-Fire Department “Risk Assessment” studies as part of “Standards of Coverage” documents.

-Other pre-plan documents.

Bottom line: Damage Assessment team members are given a numbered list of locations deemed necessary to check.

Drill Contents: Damage Assessment ***Pre-Planning***
Forms given to response team members

Target List should be:

- All forms need to have the same references.

  For example: “Target 26” can’t be different between forms.

- **Geographically divide them up. So minimum travel between groups of targets.**

- Don’t overwhelm single participants with too many targets. Speed matters.

Drill Contents: Damage Assessment ***Pre-Planning*** Forms given to response team members.

Assessment sample form example:

Lacey West. All areas South of I-5 and West of College St. (Area 6)

1. Panorama City. (Contact Local CERT team if possible)
2. South Sound Villa Apartments at 4101 Lacey Blvd.
3. Fred Meyer Complex 700 Sleater Kinney Rd.
4. South Sound Center/Mall 650 Sleater Kinney Rd. SE.
5. Lacey Corporate Apartment Building 5001 College Street.
6. Woodland's Retirement Home @ 4532 Intelco Loop.
7. Bonaventure Retirement Home @ 4528 Intelco Loop.
8. Horizon's Elementary School at 67th and College/Rainier Rd.
9. Centennial Elementary at 2600 45th Avenue off Boulevard Rd. SE.

Drill Contents: Damage Assessment ***Job Aides***
Forms given to response team members.

Definitions to help assessment team members:

A Quick Guide to Damage Assessment Definitions and Descriptions

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Examples: Carpet on first floor is soaked, chimney and porch is damaged, landscaping is damaged, business sign is damaged, broken windows, some shingles missing. etc.

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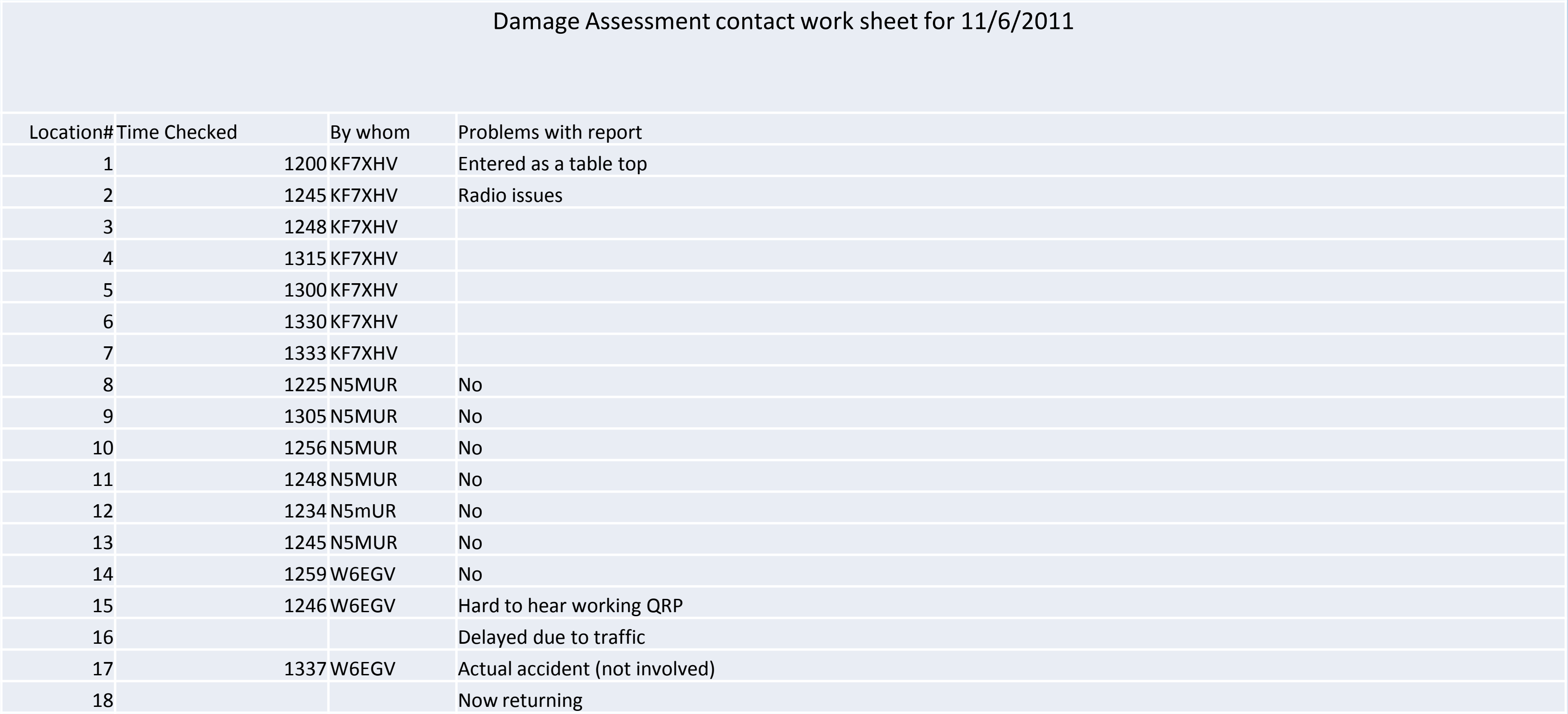
Drill Contents: Damage Assessment ***Objectives*** “Net Control” Forms

Net Control forms example: Log Sheets



Damage Assessment contact work sheet for 11/6/2011

Location#	Time Checked	By whom	Problems with report
1	1200	KF7XHV	Entered as a table top
2	1245	KF7XHV	Radio issues
3	1248	KF7XHV	
4	1315	KF7XHV	
5	1300	KF7XHV	
6	1330	KF7XHV	
7	1333	KF7XHV	
8	1225	N5MUR	No
9	1305	N5MUR	No
10	1256	N5MUR	No
11	1248	N5MUR	No
12	1234	N5mUR	No
13	1245	N5MUR	No
14	1259	W6EGV	No
15	1246	W6EGV	Hard to hear working QRP
16			Delayed due to traffic
17	1337	W6EGV	Actual accident (not involved)
18			Now returning

Drill Contents: Damage Assessment ***Objectives*** “Net Control” Forms

Net Control Forms: Damage Collection Information

Key Point:

Like Radiograms, net control and the damage assessment team members use the same forms to record the damage.

This helps with speed, decreases confusion by using similar formats, and allows team members aiding net control to compile the information.

Drill Contents: **Damage Assessment Forms**
Forms given to response team members

Date of Event:	11/6/2011		Incident name/type:			Earthquake			
Field Observation Report or [✓ Collection Log:]					(circle the choice to the left)				
General Area of Collection		4				Member Name	N5 MUR		
Entry #	9	Time the entry was checked: 1305							
Address or Location of Entry: Centennial Elementary School									
Type of location inspected : School									
Primary Problem: (circle it)									
[✓ Life Safety]		Deaths and injuries				Type and Severity			
Iminent Hazard	(circle it)	Electrical	[✓ Gas leak]	[✓ Collapse]	Fire	[✓ Trapped]	HazMat	Flood	Other
Infrastructure/lifeline (circle)		Utility	Transport	Critical Service		Communications		High Life Threat	
Describe the problem:		Major collapse, a few people are reported trapped. There is a smell of gas in the area.							
Identify Special Needs:									
Damage is : (circle one)		Affected		Minor Damage		[✓ Major Damage]		Destroyed	

Drill Contents: The Script

-Use these for either a table top or practical drills.
-Also use for trying new methods or identifying drill evolution problems.

Script excerpt: 9-10 of 63 target hazards.

8. Cabella's. Britton Parkway and Gateway Blvd. There were many people at the time of the earthquake and a make shift hospital/treatment area has been established under the north eves. Staff will tell you 15 to 20 people are injured and some have died. Evidently there was a partial floor collapse and stuff from the ceiling fell. Some patients are being taken to St. Peter's in the back of pickups and vans. Some people are reportedly still trapped but unknown how many.

9. Water tower at Marvin Road and 41st Ave. NE. The water tank has ruptured. Marvin Road is partially obstructed, and 41st Ave NE is not passable due to down trees and debris.

> *Incidental findings if passed.* The neighborhood north of 41st avenue has two clear thermal columns from apparent house fires.

10. Fire station at 3701 Willamette Drive. The station appears intact. The fire engine is out of the station but the smaller brush engine has been rolled out and parked out front. There is a gathering of people with some injured in the parking lot. Maybe 4 to 6 civilians. No fire fighters observed. Power out in the area but a generator is heard running.

So how did HAMS do at rapid damage assessment?

So how did HAMS do at rapid damage assessment?

- ✓ -First location checked within 25 minutes after the earthquake.
- ✓ -Within 1.5hours over half or 35 targets were physically checked and reported.
- ✓ -Within 1.5 hours, the balance of the targets were still assigned to be checked.
- ✓ -Accuracy of the damage was almost always interpreted correctly from the script.

And it was done with 5 operators for an area of over 77 square miles! (note 2 of the 5 operators didn't have the pre-practical drill class)

So how did HAMS do at rapid damage assessment?

Table Top Interpretations: (Did they get it right simply through looking at photos?)

- ✓ -Adjusted score was 77% for correct damage reporting accuracy.
- ✓ -93% accuracy if they adjacent answer was also considered successful. For example: “destroyed” was selected when the desired answer was just “major” damage.
- ✓ -95% accuracy on determining if an observed event was significant enough to report.

So how did HAMS do at rapid damage assessment?

Ham Surprises

-Some HAMS used IP applications to facilitate tracking of targets.
Such as Google maps to track assigned targets and completed targets.

-Another HAM reported pre-loading the locations into a GPS and simply selected targets as they were assigned to him.

-Some HAMS traveled 25 miles out to start the drill.

Future Implications:

- ✓ HAMS did all functions of the drill separate from fire department or commercial communications systems.
- ✓ HAMS displayed flexibility to work in Ad-Hoc groups with minimal preparation.
- ✓ HAMS demonstrated the ability to use digital/data modes even when not asked of them.
- ✓ HAMS demonstrated a capacity for perhaps other missions.
- ✓ HAMS completed all operations independent of any other agency’s assistance. They were self sufficient.

Future Implications:

Key question:

Is there another group who could have performed the mission with no additional support other than basic mission guidance in the time lines provided?

Not that I have seen.

Future Implications:

- ✓ FIRST-NET data use?
- ✓ EOC/ECC staffing?
- ✓ IMT Staffing or information staffing?
- ✓ Use of surplus fire service radio equipment?
  - -What's more valuable to a fire department, $200 or a volunteer HAM who can use a 110 watt, digital/data capable radio on amateur bands or commercial service when needed?

Other missions in times of disaster?

A Huge Thank You!

TCARES:

Thurston County Emergency Amateur Radio Service

With specific thanks to

Steve Tomlin (KE7YYX)
And
Tom Bohon (KE7EJJ)

Thank you!

Questions?

Lt. Jason Berman,
Lacey Fire District #3

Contact:
Jberman@laceyfire.com

KE7IHC

The full project report:
http://www.usfa.fema.gov/pdf/efop/efo46103.pdf

Thank you!